WHAT IS CLAIMED IS:

1. A composition comprising:

a) a mammalian cell cytoplasmic extract;

b) a methylated cap analog; and

c) a cap-labeled mRNA substrate.

2. The composition of claim 1 wherein said mammalian cell cytoplasmic extract is an S100 extract which comprises a 100,000 x g, 1 hour supernatant from a mammalian cell lysate.

3. The composition of claim 2 wherein said extract is prepared by dialysis of a said extract containing 10% glycerol.

4. The composition of claim 1 wherein said mammalian cell lysate is obtained from a mammalian cell or tissue.

5. The composition of claim 4 wherein said mammalian cell is a HeLa cell.

6. The composition of claim 1 wherein said methylated cap analog is ^{7me}GpppG or ^{7me}GTP.

7. The composition of claim 1 comprising components for additionally detecting mRNA deadenylation and degradation.

8. The composition of claim 7 wherein said mammalian cell cytoplasmic extract is depleted of activity of proteins that bind polyadenylate.

9. The composition of claim 1 wherein said cap-labeled mRNA substrate is labeled at the alpha phosphate of the cap.

10. The composition of claim 9 wherein said label is a radioactive label, a non-radioactive isotopic label, a fluorescent moiety, a visibly-detectable moiety, a releasable substrate or a co-factor for a chemical or enzymatic reaction.

11. The composition of claim 1 wherein said cap-labeled mRNA substrate comprises poly(A) or at least one RNA element.

12. The composition of claim 11 wherein said RNA element is an AU-rich element.

13. The composition of claim 11 wherein said RNA element is a pyrimidine-rich element.

14. A polypeptide which has a molecular weight of about 50 to about 100 kilodaltons (kD) in molecular exclusion chromatography, precipitates with 20% ammonium sulfate, elutes at between about 440 to 500mM NaCl from a heparin-Sepharose column, and decaps mammalian RNA.

15. A polynucleotide which encodes a polypeptide which has a molecular weight of about 50 to about 100 kilodaltons (kD) in molecular exclusion chromatography, precipitates with 20% ammonium sulfate, elutes at between about 440 to 500mM NaCl from a heparin-Sepharose column, and decaps mammalian RNA.

16. An antibody which binds specifically and with high affinity to a polypeptide which has a molecular weight of about 50 to about 100 kilodaltons (kD) in molecular exclusion chromatography, precipitates with 20% ammonium sulfate, elutes at between about 440 to 500mM NaCl from a heparin-Sepharose column, and decaps mammalian RNA.

17. A kit for *in vitro* mammalian mRNA decapping comprising:

a) a mammalian cell cytoplasmic extract; and

b) a methylated cap analog.

18. The kit of claim 17 further comprising a cap-labeled mRNA substrate.

19. The kit of claim 18 wherein said cap-labeled mRNA substrate is labeled at the alpha phosphate of the cap.

20. The kit of claim 19 wherein said label is a radioactive label, a non-radioactive isotopic label, a fluorescent moiety, a visibly-detectable moiety, a releasable substrate or a co-factor for a chemical or enzymatic reaction.

21. The kit of claim 17 wherein said mammalian cell cytoplasmic extract is depleted of activity of proteins that bind polyadenylate.

22. A method for carrying out *in vitro* mammalian mRNA decapping comprising the steps of

a) providing the composition of claim 1,

b) incubating said composition at about 30°C for about 30 min and monitoring decapping by detection of release of label from said cap-labeled RNA.

23. A method for identifying a compound as a modulator of mammalian mRNA decapping comprising carrying out the method of claim 22 in the presence and absence of said compound, and correlating any change in decapping by the presence of said compound with modulator activity of said compound.

24. The method of claim 23 wherein said cap-labeled mRNA substrate comprises poly(A) or at least one RNA element.

25. The composition of claim 23 wherein said RNA element is an AU-rich element.

26. The composition of claim 23 wherein said RNA element is a pyrimidine-rich element.

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